

SUGARBUSH RESIDENTIAL DEVELOPMENT PROJECT

APPENDIX K

STORM WATER MANAGEMENT PLAN

GPA 05-010/TM 5295RPL7/R04-008/SP 03-003/
S04-015/LOG No. 02-08-047
SCH No. 2005121098

for the

DRAFT FINAL ENVIRONMENTAL IMPACT REPORT

AUGUST 2010

STORM WATER MANAGEMENT PLAN

SUGARBUSH COUNTY OF SAN DIEGO TM5295 RPL7/LOG No. 02-08-047

Prepared for:

Sugarbush, LLC
P.O. Box 231639
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Prepared by:

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July 10, 2008
Revised May 26, 2009

W.O. 600-0813-400

Storm Water Management Plan For Priority Projects (Major SWMP)

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name: Sugarbush	TM 5295RPL7 W.O. 600-0813-400
Permit Number (Land Development Projects):	
Work Authorization Number (CIP only):	
Applicant:	Sugarbush, LLC
Applicant's Address: P.O. Box 231639,	Encintas, CA 92023-1639
Plan Prepare By (<i>Leave blank if same as applicant</i>):	BHA Inc. 5115 Avendia Encinas, Ste I Carlsbad, Ca 92008
Date:	March 11, 2005
Revision Date (If applicable):	May 26, 2009

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9424) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	

Instructions for a Major SWMP can be downloaded at <http://www.co.san-diego.ca.us/dpw/stormwater/susmp.html>.

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

PROJECT DESCRIPTION

Please provide a brief description of the project in the following box. Please include:

- Project Location
- Project Description
- Physical Features (Topography)
- Surrounding Land Use
- Proposed Project Land Use
- Location of dry weather flows (year-round flows in streams, or creeks) within project limits, if applicable.

Project Location: The 115.5 acre site is located located south of Buena Creek Road at Sugarbush Drive. The westerly boundary is adjacent to Lone Oak Road and Cleveand Trail.

Project Description: The development of 115.5 acres will include 45 single family residences. The majority of the site drains toward the westerly boundary. The remaining area in the southeasterly corner of the property drains in an southeasterly direction into a proposed permanent open space area.

Topography: The site falls west of the San Marcos mountains, and topography varies from moderate to steep. On-site elevations range from 1050 feet to 540 feet mean sea level. Runoff from the site is conveyed by several natural drainage courses in a westerly direction toward Buena Creek in the existing runoff conditions.

Project Land Use and Surrounding Land Use: The site is currently undeveloped. The development of the subdivision proposes 45 residential lots and streets on 35.4 acres of land with minimum lot size of one half acre. The existing surrounding developments are zoned for 1 residential units per acre.

Dry Weather Flows: There was little or any signs of erosion on-site. The existing drainage courses had no standing water.

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PRIORITY DEVELOPMENT PROJECT DETERMINATION

Please check the box that best describes the project. Does the project meet one of the following criteria?

Table 1

PRIORITY DEVELOPMENT PROJECT	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area	X	
Residential development of more than 10 units	X	
Commercial developments with a land area for development of greater than 1 acre		X
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface	X	
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.		X
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff		X
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		X

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project.

If you answered **YES** to any of the questions, please continue.

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management issues.

Table 2

	QUESTIONS	YES	NO	Information
1.	Will the proposed project disturb 50 or more acres of land? (Including all phases of development)		x	If YES, continue to 2. If NO, go to 6.
2.	Would the project site discharge directly into channels that are concrete-lined or significantly hardened such as with rip-rap, sackcrete, etc, downstream to their outfall into bays or the ocean?		x	If NO, continue to 3. If YES, go to 6.
3.	Would the project site discharge directly into underground storm drains discharging directly to bays or the ocean?		x	If NO, continue to 4. If YES, go to 6.
4.	Would the project site discharge directly to a channel (lined or un-lined) and the combined impervious surfaces downstream from the project site to discharge at the ocean or bay are 70% or greater?		x	If NO, continue to 5. If YES, go to 6.
5.	Project is required to manage hydromodification impacts.			Hydromodification Management Required as described in Section 67.812 b(4) of the WPO.
6.	Project is not required to manage hydromodification impacts.			Hydromodification Exempt. Keep on file.

An exemption is potentially available for projects that are required (No. 5. in Table 2 above) to manage hydromodification impacts: The project proponent may conduct an independent geomorphic study to determine the project's full hydromodification impact. The study must incorporate sediment transport modeling across the range of geomorphically-significant flows and demonstrate to the County's satisfaction that the project flows and sediment reductions will not detrimentally affect the receiving water to qualify for the exemption.

STORMWATER QUALITY DETERMINATION

The following questions provide a guide to collecting information relevant to project stormwater quality issues. Please provide the following information in a printed report accompanying this form.

Table 3

	QUESTIONS	COMPLETED	NA
1.	Describe the topography of the project area.	X	
2.	Describe the local land use within the project area and adjacent areas.	X	
3.	Evaluate the presence of dry weather flow.	X	
4.	Determine the receiving waters that may be affected by the project throughout all phases of development (i.e., construction, maintenance and operation).	X	
5.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	X	
6.	Determine if there are any High Risk Areas (which is defined by the presence of municipal or domestic water supply reservoirs or groundwater percolation facilities) within the project limits.		X
7.	Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.		X
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	X	
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.	X	
10.	Determine contaminated or hazardous soils within the project area.		X

TREATMENT BMPs DETERMINATION

Complete the checklist below to determine if Treatment Best Management Practices (BMPs) are required for the project.

Table 4

No.	CRITERIA	YES	NO	INFORMATION
1.	Is this an emergency project		x	If YES, go to 6. If NO, continue to 2.
2.	Have TMDLs been established for surface waters within the project limit?		x	If YES, go to 5. If NO, continue to 3.
3.	Will the project directly discharge to a 303(d) impaired receiving water body?		x	If YES, go to 5. If NO, continue to 4.
4.	Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the <i>County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects</i> ?		x	If YES, continue to 5. If NO, go to 6.
5.	Provide Treatment BMPs for the project.	x		If YES, go to 7.
6.	Project is not required to provide Treatment BMPs		x	Document for Project Files by referencing this checklist.
7.	End			

Now that the need for a treatment BMPs has been determined, other information is required to complete the SWMP.

WATERSHED

Please check the watershed(s) for the project.

<input type="checkbox"/> San Juan 901	<input type="checkbox"/> Santa Margarita 902	<input type="checkbox"/> San Luis Rey 903	<input checked="" type="checkbox"/> Carlsbad 904
<input type="checkbox"/> San Dieguito 905	<input type="checkbox"/> Penasquitos 906	<input type="checkbox"/> San Diego 907	<input type="checkbox"/> Sweetwater 909
<input type="checkbox"/> Otay 910	<input type="checkbox"/> Tijuana 911	<input type="checkbox"/> Whitewater 719	<input type="checkbox"/> Clark 720
<input type="checkbox"/> West Salton 721	<input type="checkbox"/> Anza Borrego 722	<input type="checkbox"/> Imperial 723	

Please provide the hydrologic sub-area and number(s)

Number	Name
904.32	Buena- Buena Creek is impaired with DDT, Nitrate and Nitrite, and Phosphate.
904.31	Downstream water bodies- Aqua Hedionda Creek is impaired with Manganese, selenium, sulfates, TDS and Aqua Hedionda Lagoon is impaired with Indicator Bacteria,

Please provide the beneficial uses for Inland Surface Waters and Ground Waters.

Beneficial Uses can be obtained from the Water Quality Control Plan for the San Diego Basin, which is available at the Regional Board office or at <http://www.swrcb.ca.gov/rwqcb9/programs/basinplan.html>.

SURFACE WATERS	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters	904.32	X	X	X					X	X		X		X		
Ground Waters	904.32	X	X	X												

* Excepted from Municipal

X Existing Beneficial Use

0 Potential Beneficial Use

POLLUTANTS OF CONCERN

Using Table 5, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

Table 5. Anticipated and Potential Pollutants Generated by Land Use Type

<i>PDP Categories</i>	<i>General Pollutant Categories</i>								
	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P ⁽¹⁾	P ⁽²⁾	P	X
Commercial Development 1 acre or greater	P ⁽¹⁾	P ⁽¹⁾		P ⁽²⁾	X	P ⁽⁵⁾	X	P ⁽³⁾	P ⁽⁵⁾
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X ⁽⁴⁾⁽⁵⁾	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft ²	X	X			X	X	X		X
Parking Lots	P ⁽¹⁾	P ⁽¹⁾	X		X	P ⁽¹⁾	X		P ⁽¹⁾
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P ⁽¹⁾	X	X ⁽⁴⁾	X	P ⁽⁵⁾	X		
X = anticipated P = potential (1) A potential pollutant if landscaping exists on-site. (2) A potential pollutant if the project includes uncovered parking areas. (3) A potential pollutant if land use involves food or animal waste products. (4) Including petroleum hydrocarbons. (5) Including solvents.									

Note: If other monitoring data that is relevant to the project is available. Please include as Attachment C.

CONSTRUCTION BMPs

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- | | |
|---|--|
| <input checked="" type="checkbox"/> Silt Fence | <input checked="" type="checkbox"/> Desilting Basin |
| <input checked="" type="checkbox"/> Fiber Rolls | <input checked="" type="checkbox"/> Gravel Bag Berm |
| <input checked="" type="checkbox"/> Street Sweeping and Vacuuming | <input type="checkbox"/> Sandbag Barrier |
| <input checked="" type="checkbox"/> Storm Drain Inlet Protection | <input checked="" type="checkbox"/> Material Delivery and Storage |
| <input checked="" type="checkbox"/> Stockpile Management | <input checked="" type="checkbox"/> Spill Prevention and Control |
| <input checked="" type="checkbox"/> Solid Waste Management | <input checked="" type="checkbox"/> Concrete Waste Management |
| <input checked="" type="checkbox"/> Stabilized Construction Entrance/Exit | <input checked="" type="checkbox"/> Water Conservation Practices |
| <input type="checkbox"/> Dewatering Operations | <input checked="" type="checkbox"/> Paving and Grinding Operations |
| <input type="checkbox"/> Vehicle and Equipment Maintenance | |
- ☒ Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an “exceptional threat to water quality,” and therefore require Advanced Treatment Best Management Practices.

Table 6

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r9_06_303d_req1mdls.pdf		x	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?			If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?			If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k_f greater than or equal to 0.4?			If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	x		Document for Project Files by referencing this checklist.
6.	Project poses an “exceptional threat to water quality” and is required to use Advanced Treatment BMPs.		x	Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

Exemption potentially available for projects that require advanced treatment:

Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official's satisfaction that advanced treatment is not required

Now that the need for treatment BMPs has been determined, other information is needed to complete the SWMP.

SITE DESIGN

To minimize stormwater impacts, site design measures must be addressed. The following checklist provides options for avoiding or reducing potential impacts during project planning. If YES is checked, it is assumed that the measure was used for this project.

Table 7

	OPTIONS	YES	NO	N/A
1.	Has the project been located and road improvements aligned to avoid or minimize impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?	x		
2.	Is the project designed to minimize impervious footprint?	x		
3.	Is the project conserving natural areas where feasible?	x		
4.	Where landscape is proposed, are rooftops, impervious sidewalks, walkways, trails and patios be drained into adjacent landscaping?	x		
5.	For roadway projects, are structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?			x
6.	Can any of the following methods be utilized to minimize erosion from slopes:			
6.a.	Disturbing existing slopes only when necessary?	x		
6.b.	Minimize cut and fill areas to reduce slope lengths?	x		
6.c.	Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?	x		
6.d.	Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?		x	
6.e.	Rounding and shaping slopes to reduce concentrated flow?	x		
6.f.	Collecting concentrated flows in stabilized drains and channels?	x		

LOW IMPACT DEVELOPMENT (LID)

Each numbered item below is a LID requirement of the WPO. Please check the box(s) under each number that best describes the Low Impact Development BMP(s) selected for this project.

Table 8

1. Conserve natural Areas, Soils, and Vegetation-County LID Handbook 2.2.1
<input type="checkbox"/> Preserve well draining soils (Type A or B)
<input type="checkbox"/> Preserve Significant Trees
<input checked="" type="checkbox"/> Other. Description: Providing 77.13 acres of open space or 67% of project area
<input type="checkbox"/> 1. Not feasible. State Reason:
2. Minimize Disturbance to Natural Drainages-County LID Handbook 2.2.2
<input checked="" type="checkbox"/> Set-back development envelope from drainages
<input type="checkbox"/> Restrict heavy construction equipment access to planned green/open space areas
<input type="checkbox"/> Other. Description:
<input type="checkbox"/> 2. Not feasible. State Reason:
3. Minimize and Disconnect Impervious Surfaces (see 5) -County LID Handbook 2.2.3
<input checked="" type="checkbox"/> Clustered Lot Design
<input checked="" type="checkbox"/> Items checked in 5?
<input type="checkbox"/> Other. Description:
<input type="checkbox"/> 3. Not feasible. State Reason:
4. Minimize Soil Compaction-County LID Handbook 2.2.4
<input checked="" type="checkbox"/> Restrict heavy construction equipment access to planned green/open space areas
<input type="checkbox"/> Re-till soils compacted by construction vehicles/equipment
<input type="checkbox"/> Collect & re-use upper soil layers of development site containing organic materials
<input type="checkbox"/> Other. Description:
4. Not feasible. State Reason: Areas adjacent to foundations, roads, and manufactured slopes must be compacted to a minimum soil density requirement.
5. Drain Runoff from Impervious Surfaces to Pervious Areas-County LID Handbook 2.2.5

LID Street & Road Design	
<input type="checkbox"/>	Curb-cuts to landscaping
<input type="checkbox"/>	Rural Swales
<input type="checkbox"/>	Concave Median
<input type="checkbox"/>	Cul-de-sac Landscaping Design
<input checked="" type="checkbox"/>	Other. Description: Majority of runoff from project to be treated by bioretention basins. Lots 11 and 33 to be treated by biofilter (grassy swale)
LID Parking Lot Design	
<input type="checkbox"/>	Permeable Pavements
<input type="checkbox"/>	Curb-cuts to landscaping
<input type="checkbox"/>	Other. Description: No proposed parking lots
LID Driveway, Sidewalk, Bike-path Design	
<input type="checkbox"/>	Permeable Pavements
<input type="checkbox"/>	Pitch pavements toward landscaping
<input checked="" type="checkbox"/>	Other. Description: Drain driveways into landscaped areas where practicable
LID Building Design	
<input type="checkbox"/>	Cisterns & Rain Barrels
<input checked="" type="checkbox"/>	Downspout to swale
<input type="checkbox"/>	Vegetated Roofs
<input type="checkbox"/>	Other. Description: N/A
LID Landscaping Design	
<input checked="" type="checkbox"/>	Soil Amendments
<input checked="" type="checkbox"/>	Reuse of Native Soils
<input checked="" type="checkbox"/>	Smart Irrigation Systems
<input type="checkbox"/>	Street Trees
<input type="checkbox"/>	Other. Description:
<input type="checkbox"/> 5. Not feasible. State Reason:	

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

Table 9

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?	x			If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?		x		If YES go to 6.
3.	Will the project discharge to unlined channels?	x			If YES go to 6.
4.	Will the project increase potential sediment load of downstream flow?		x		If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?		x		If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.			x	Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.			x	Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.	x			Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	x			Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.	x			
11.	“Hardening“ natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.			x	Continue to 12.
12.	Provide other design principles that are comparable and equally effective.			x	Continue to 13.
13.	End				

SOURCE CONTROL

Please complete the following checklist for Source Control BMPs. If the BMP is not applicable for this project, then check N/A only at the main category.

Table 10

BMP			YES	NO	N/A
1.	Provide Storm Drain System Stenciling and Signage				
	1.a.	All storm drain inlets and catch basins within the project area shall have a stencil or tile placed with prohibitive language (such as: "NO DUMPING – DRAINS TO _____") and/or graphical icons to discourage illegal dumping.	X		
	1.b.	Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the project area.			X
2.	Design Outdoors Material Storage Areas to Reduce Pollution Introduction				
	2.a.	This is a detached single-family residential project. Therefore, personal storage areas are exempt from this requirement.	X		
	2.b.	Hazardous materials with the potential to contaminate urban runoff shall either be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the storm water conveyance system; or (2) protected by secondary containment structures such as berms, dikes, or curbs.			X
	2.c.	The storage area shall be paved and sufficiently impervious to contain leaks and spills.			X
	2.d.	The storage area shall have a roof or awning to minimize direct precipitation within the secondary containment area.			X
3.	Design Trash Storage Areas to Reduce Pollution Introduction				
	3.a.	Paved with an impervious surface, designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash; or,			X
	3.b.	Provide attached lids on all trash containers that exclude rain, or roof or awning to minimize direct precipitation.			X
4.	Use Efficient Irrigation Systems & Landscape Design				
	The following methods to reduce excessive irrigation runoff shall be considered, and incorporated and implemented where determined applicable and feasible.				
	4.a.	Employing rain shutoff devices to prevent irrigation after precipitation.	X		
	4.b.	Designing irrigation systems to each landscape area's specific water requirements.	X		
	4.c.	Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.	X		
	4.d.	Employing other comparable, equally effective, methods to reduce irrigation water runoff.	X		
5.	Private Roads				

BMP		YES	NO	N/A
	The design of private roadway drainage shall use at least one of the following			
5.a.	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings.			
5.b.	Urban curb/swale system: street slopes to curb, periodic swale inlets drain to vegetated swale/biofilter.			
5.c.	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to storm water conveyance system.			
5.d.	Other methods that are comparable and equally effective within the project.	X		
6.	Residential Driveways & Guest Parking			
	The design of driveways and private residential parking areas shall use one at least of the following features.			
6.a.	Design driveways with shared access, flared (single lane at street) or wheelstrips (paving only under tires); or, drain into landscaping prior to discharging to the storm water conveyance system.	X		
6.b.	Uncovered temporary or guest parking on private residential lots may be: paved with a permeable surface; or, designed to drain into landscaping prior to discharging to the storm water conveyance system.			X
6.c.	Other features which are comparable and equally effective.			X
7.	Dock Areas			
	Loading/unloading dock areas shall include the following.			
7.a.	Cover loading dock areas, or design drainage to preclude urban run-on and runoff.			X
7.b.	Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.			X
7.c.	Other features which are comparable and equally effective.			X
8.	Maintenance Bays			
	Maintenance bays shall include the following.			
8.a.	Repair/maintenance bays shall be indoors; or, designed to preclude urban run-on and runoff.			X
8.b.	Design a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.			X
8.c.	Other features which are comparable and equally effective.			X
9.	Vehicle Wash Areas			
	Priority projects that include areas for washing/steam cleaning of vehicles shall use the following.			
9.a.	Self-contained; or covered with a roof or overhang.			X
9.b.	Equipped with a clarifier or other pretreatment facility.			X
9.c.	Properly connected to a sanitary sewer.			X
9.d.	Other features which are comparable and equally effective.			X

BMP		YES	NO	N/A
10.	Outdoor Processing Areas			
	Outdoor process equipment operations, such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, waste piles, and wastewater and solid waste treatment and disposal, and other operations determined to be a potential threat to water quality by the County shall adhere to the following requirements.			X
	10.a. Cover or enclose areas that would be the most significant source of pollutants; or, slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.			X
	10.b. Grade or berm area to prevent run-on from surrounding areas.			X
	10.c. Installation of storm drains in areas of equipment repair is prohibited.			X
	10.d. Other features which are comparable or equally effective.			X
11.	Equipment Wash Areas			
	Outdoor equipment/accessory washing and steam cleaning activities shall be.			
	11.a. Be self-contained; or covered with a roof or overhang.			X
	11.b. Be equipped with a clarifier, grease trap or other pretreatment facility, as appropriate			X
	11.c. Be properly connected to a sanitary sewer.			X
	11.d. Other features which are comparable or equally effective.			X
12.	Parking Areas			
	The following design concepts shall be considered, and incorporated and implemented where determined applicable and feasible by the County.			
	12.a. Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.			X
	12.b. Overflow parking (parking stalls provided in excess of the County's minimum parking requirements) may be constructed with permeable paving.			X
	12.c. Other design concepts that are comparable and equally effective.			X
13.	Fueling Area			
	Non-retail fuel dispensing areas shall contain the following.			
	13.a. Overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area shall drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.			X
	13.b. Paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.			X
	13.c. Have an appropriate slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of urban runoff.			X

BMP			YES	NO	N/A
	13.d.	At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.			X

Please list other project specific Source Control BMPs in the following box. Write N/A if there are none.

Street Sweeping and Vacuuming.

TREATMENT CONTROL

To select a structural treatment BMP using Treatment Control BMP Selection Matrix (Table 11), each priority project shall compare the list of pollutants for which the downstream receiving waters are impaired (if any), with the pollutants anticipated to be generated by the project (as identified in Table 5). Any pollutants identified by Table 5, which are also causing a Clean Water Act section 303(d) impairment of the receiving waters of the project, shall be considered primary pollutants of concern. Priority projects that are anticipated to generate a primary pollutant of concern shall select a single or combination of stormwater BMPs from Table 11, which **maximizes pollutant removal** for the particular primary pollutant(s) of concern.

Priority development projects that are **not** anticipated to generate a pollutant for which the receiving water is CWA 303(d) impaired shall select a single or combination of stormwater BMPs from Table 11, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the “maximum extent practicable” standard.

Table 11. Treatment Control BMP Selection Matrix

Pollutants of Concern	Bioretention Facilities (LID)*	Settling Basins (Dry Ponds)	Wet Ponds and Wetlands	Infiltration Facilities or Practices (LID)*	Media Filters	High-rate biofilters	High-rate media filters	Trash Racks & Hydro-dynamic Devices
Coarse Sediment and Trash	High	High	High	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	High	High	High	High	High	Medium	Medium	Low
Pollutants that tend to be dissolved following treatment	Medium	Low	Medium	High	Low	Low	Low	Low

*Additional information is available in the County of San Diego LID Handbook.

NOTES ON POLLUTANTS OF CONCERN:

In Table 12, Pollutants of Concern are grouped as gross pollutants, pollutants that tend to associate with fine particles, and pollutants that remain dissolved.

Table 12

Pollutant	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	
Nutrients		X	X
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris	X		
Oxygen Demanding		X	
Bacteria		X	
Oil & Grease		X	
Pesticides		X	

A Treatment BMP must address runoff from developed areas. Please provide the post-construction water quality values for the project. Label outfalls on the BMP map. The Water Quality peak rate of discharge flow (Q_{WQ}) and the Water Quality storage volume (V_{WQ}) is dependent on the type of treatment BMP selected for the project.

Outfall	Tributary Area (acres)	Q_{WQ} (cfs)	V_{WQ} (ft³)
Node 6.4	3.5	0.70	N/A
Node 12.6	36.4	7.28	N/A
Node 21.3	9.1	1.82	N/A
Lot 11	0.7	0.13	N/A
Lot 33	0.7	0.13	N/A

Please check the box(s) that best describes the Treatment BMP(s) selected for this project.

Biofilters
<input checked="" type="checkbox"/> Bioretention swale Detention-bioretention basin
<input checked="" type="checkbox"/> Vegetated filter strip Biofilter (Grassy Swale)
<input type="checkbox"/> Stormwater Planter Box (open-bottomed)
<input type="checkbox"/> Stormwater Flow-Through Planter (sealed bottom)
<input type="checkbox"/> Bioretention Area
<input type="checkbox"/> Vegetated Roofs/Modules/Walls
Detention Basins
<input type="checkbox"/> Extended/dry detention basin with grass/vegetated lining
<input type="checkbox"/> Extended/dry detention basin with impervious lining
Infiltration Basins
<input type="checkbox"/> Infiltration basin
<input type="checkbox"/> Infiltration trench
<input type="checkbox"/> Dry well
<input type="checkbox"/> Permeable Paving
<input type="checkbox"/> Gravel
<input type="checkbox"/> Permeable asphalt
<input type="checkbox"/> Pervious concrete
<input type="checkbox"/> Unit pavers, ungrouted, set on sand or gravel
<input type="checkbox"/> Subsurface reservoir bed
Wet Ponds or Wetlands
<input type="checkbox"/> Wet pond/basin (permanent pool)
<input type="checkbox"/> Constructed wetland
Filtration
<input type="checkbox"/> Media filtration
<input type="checkbox"/> Sand filtration
Hydrodynamic Separator Systems
<input type="checkbox"/> Swirl Concentrator
<input type="checkbox"/> Cyclone Separator
Trash Racks and Screens

Include Treatment Datasheet as Attachment E. The datasheet should include the following:	COMPLETED	NO
1. Description of how treatment BMP was designed. Provide a description for each type of treatment BMP.	x	
2. Engineering calculations for the BMP(s)	x	

Please describe why the selected treatment BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a detailed explanation.

See attached discussion in Attachment E.

MAINTENANCE

Please check the box that best describes the maintenance mechanism(s) for this project. Guidelines for each category are located in Chapter 5, Section 5.2 of the County SUSMP.

CATEGORY	SELECTED	
	YES	NO
First		X
Second ¹	X	
Third ¹		X
Fourth		X

Note:

1. Projects in Category 2 or 3 may choose to establish or be included in a Stormwater Maintenance Assessment District for the long-term maintenance of treatment BMPs.

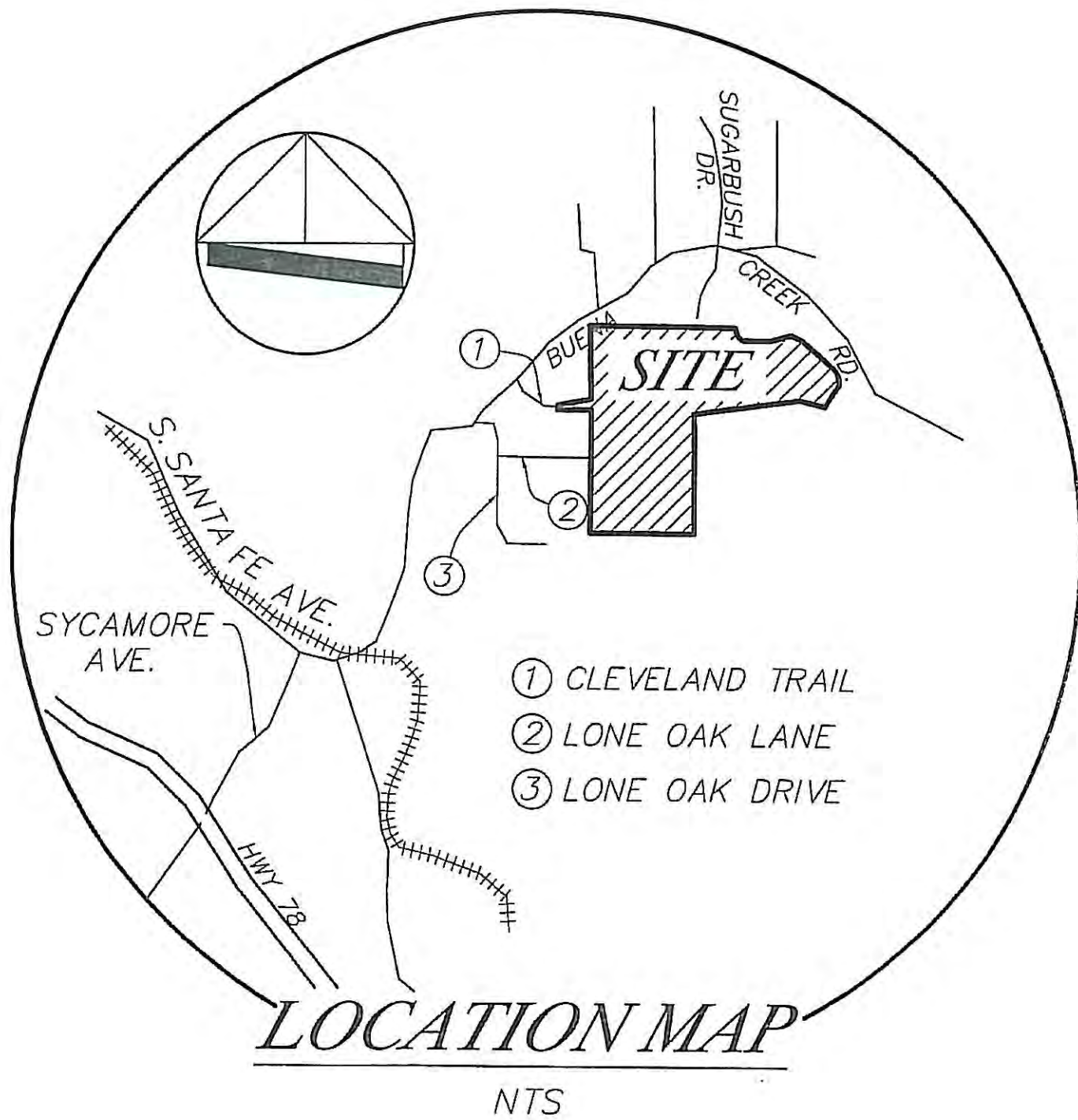
ATTACHMENTS

Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Site Map	X	
C	Relevant Monitoring Data	X	
D	LID and Treatment BMP Location Map	SEE ATTACHMENT A	
E	Treatment BMP Datasheets	X	
F	Operation and Maintenance Program for Treatment BMPs	X	
G	Fiscal Resources	X	
H	Certification Sheet	X	
I	Addendum	X	

Note: Attachments A and B may be combined.

ATTACHMENT A
PROJECT LOCATION MAP



ATTACHMENT B

SITE MAP

ATTACHMENT C

RELEVANT MONITORING DATA

(NOTE: PROVIDE RELEVANT WATER QUALITY MONITORING DATA IF AVAILABLE.)

NO RELEVANT WATER QUALITY MONITORING DATA IS AVAILABLE

ATTACHMENT D

LID AND TREATMENT BMP LOCATION MAP

SEE SITE MAP FOR LID AND TREATMENT BMP LOCATIONS

ATTACHMENT E

TREATMENT BMP DATASHEET

*(NOTE: POSSIBLE SOURCE FOR DATASHEETS CAN BE FOUND AT
WWW.CABMPHANDBOOKS.COM. INCLUDE ENGINEERING CALCULATIONS FOR SIZING
THE TREATMENT BMP.)*

Treatment BMPs

The majority of the site will be treated by detention bioretention basins at Nodes 6.4, 12.6 and 21.3. The basins will consist of a vegetation, filter strip, sand and gravel bed, and a perforated underdrain pipe system contained in a plastic liner to convey the stormwater runoff. Peak runoff flows will be detained to simulate existing runoff conditions. See calculations for sizing of minimum area for detention bioretention basins.

Runoff from Lots 11 and Lot 33 will be treated by a Biofilter (Grassy swale) prior to leaving each lot. The primary purpose of the grass swale is to convey the runoff while effectively removing the pollutants of concern. The grassy swale is designed to convey the 100-year frequency storm event and treat the rainfall from an intensity (I) equal to 0.2 inches of rainfall per hour for each hour of a storm event. Manning's roughness coefficients of 0.024 will be used for a 100-year frequency storm event and 0.24 for water quality flows (Intensity equal to 0.2).

DETENTION BIORETENTION AREA SIZING

TM5295 - SUGARBUSH

County of San Diego

9-Jul-08

Minimum Detention Bioretention Area = Impervious surface area x 0.04

NODE 6.4

Impervious Areas Draining to BMP	Area (sf)	Sizing Factor	Minimum Surface Area (sf)
Roof and Driveways	21,260	0.04	850
Streets	34,851	0.04	1,394
Minimum Bioretention-Detention Area			2,244

DETENTION BIORETENTION AREA SIZING

TM5295 - SUGARBUSH

County of San Diego

9-Jul-08

Minimum Detention Bioretention Area = Impervious surface area x 0.04

NODE 12.6

Impervious Areas Draining to BMP	Area (sf)	Sizing Factor	Minimum Surface Area (sf)
Roof and Driveways	154,472	0.04	6,179
Streets	128,847	0.04	5,154
Minimum Bioretention-Detention Area			11,333

DETENTION BIORETENTION AREA SIZING

TM5295 - SUGARBUSH

County of San Diego

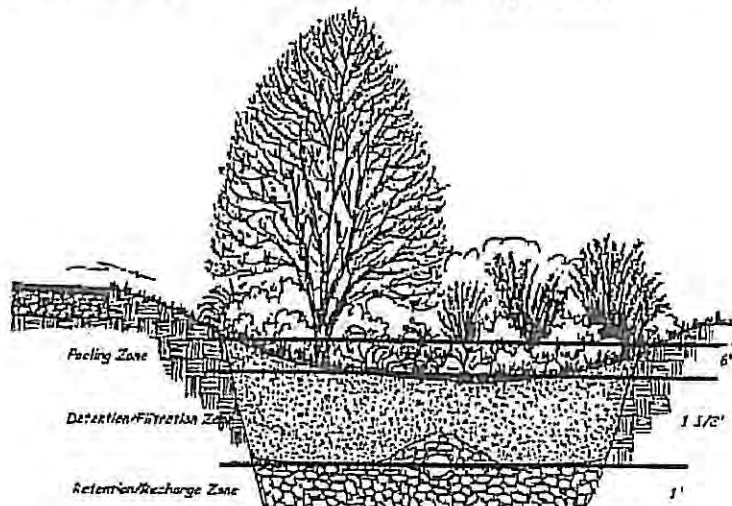
9-Jul-08

Minimum Detention Bioretention Area = Impervious surface area x 0.04

NODE 21.3

Impervious Areas Draining to BMP	Area (sf)	Sizing Factor	Minimum Surface Area (sf)
Roof and Driveways	60,292	0.04	2,412
Streets	33,000	0.04	1,320
Minimum Bioretention-Detention Area			3,732

Fact Sheet 7. Bioretention Systems



Typical Bioretention cross section, *Anatomy of a Rain Garden*, n.d.

Bioretention systems are essentially a surface and sub-surface water filtration system. In function they are similar to sand filters. Bioretention systems incorporate both plants and underlying filter soils for removal of contaminants. These facilities normally consist of a treatment train approach: filter strip, sand bed, ponding area, organic layer, planting soil, and plants.

CHARACTERISICS

- Effective in removing sediments and attached pollutants by filtration through surface vegetation, ground cover and underlying filter media layer
- Delay runoff peaks by providing retention capacity and reducing flow velocities.
- Vegetation increases aesthetic value while also enhancing filtration capacity and helping to maintain the porosity of the filter media.
- Can be constructed as either large or small scale devices, with native or amended soils.
- Small scale units are usually located in a residential planter box that filters collected stormwater through the filter media and to an outlet.
- Larger scale devices work on the same methodology, however are generally located along the streetscapes and retarding basins over large open areas.
- In addition, there are two main types of bioretention system: Non-conveyance systems, which generally pond runoff volume, and Conveyance, which generally convey minor storm events along longitudinal channels. Such conveyance systems generally include an amended soil layer under the surface for additional storage and filtration

APPLICATION

- Effective in removing medium to fine size sediments and attached pollutants (such as nutrients, free oils/grease and metals), but typically have higher pollutant

removal efficiencies for a wider range of contaminants due to enhanced filtration/biological processes associated with the surface vegetation.

- Best suited to small residential, commercial, and industrial developments with high percentages of impervious areas, including parking lots, high density residential housing, and roadways.
- Aesthetic benefits due to the surface vegetation make bioretention systems appealing for incorporation into streetscape and general landscape features.

DESIGN

- Provide a gentle slope for overland flow and adequate water storage. No water should be allowed to pond in the bioretention system for longer than 72 hours.
- Usually designed in conjunction with swales and other devices upstream so as to reduce filter clogging and provide water treatment (treatment train).
- Filter media employed is usually the plant growing material, which may comprise soil, sand and peat mixtures.
- "Planting box" type systems should be restricted to very small catchment areas.
- A subdrain system should be included in urban areas along with associated cleanout to facilitate maintenance.
- For more precise design techniques, see: CASQA (2003, January) California Stormwater BMP Handbook: New Development and Redevelopment

MAINTENANCE

- Generally, only routine periodic maintenance typical of any landscaped area (mulching, plant replacement, pruning, weeding) is necessary.
- Regular inspections and maintenance are particularly important during the vegetation establishment period.
- Routine maintenance should include a biannual health evaluation of the trees and shrubs and subsequent removal of any dead or diseased vegetation.
- Other potential tasks include soil pH regulation, erosion repair at inflow points, mulch replenishment, unclogging the under-drain, and repairing overflow structures.

LIMITATIONS

- Adequate sunlight is required for vegetation growth.
- The use of irrigation may not meet State water conservation goals. Appropriate drought-tolerant plants should be considered.
- Placement may be limited by the need for upstream pre-treatment so as to avoid filter clogging (treatment train).
- Contributing drainage area should be less than 1 acre for small-scale, on-lot devices
- Bioretention (a BMP with incidental infiltration) is not an appropriate BMP when:
 - the seasonal high groundwater table is within 6 feet of the ground surface (US EPA 1999)
 - at locations where or where surrounding soil stratum is unstable
- exceptions to the 6 foot separation can be made when:
 - the BMP is designed with an under-drain and approved by a qualified licensed professional, or when:

- written approval of a separation in the interval of 4-6 feet has been obtained by the Regional Water Quality Control Board and the Department of Environmental Health.
- Site must contain sufficient elevation relief so that subdrain system may discharge to receiving swale, curb or storm drain system.

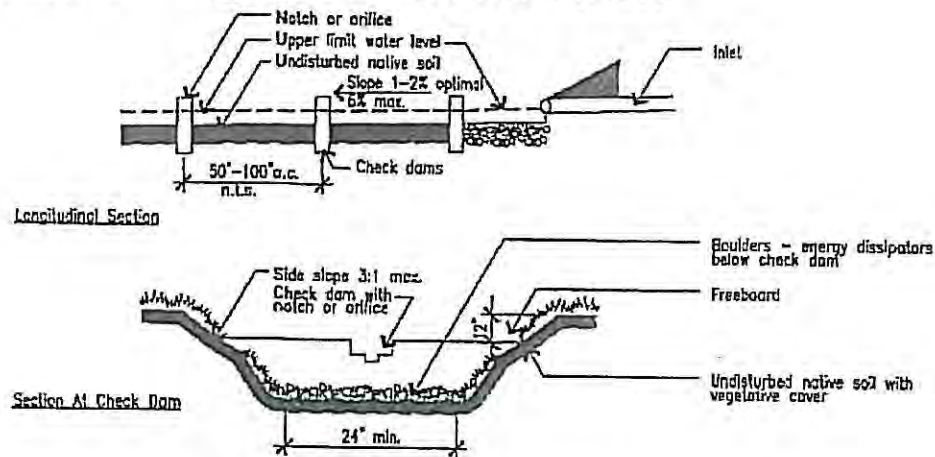
ECONOMICS

- Construction cost estimates for a bioretention area are slightly greater than those for the required landscaping for a new development (EPA, 1999).
- The operation and maintenance costs for a bioretention facility will be comparable to those of typical landscaping required for a site. (CASQA, 2003)
- Maintenance costs are projected at 5-7% of the construction cost annually.

REFERENCES

- California Stormwater Quality Association. (2003, January) California Stormwater BMP Handbook: New Development and Redevelopment.
- URS Australia Pty Ltd, (2004, May), Water Sensitive Urban Design: Technical Guidelines for Western Sydney, Upper Parramatta River Catchment Trust.
- US EPA (1999, September) BMP Fact Sheet 832-F-99-012.
<http://www.epa.gov/owmn/mtb/biortn.pdf>
- US EPA (1999, August) Preliminary Studies: Preliminary Data Summary of Urban Stormwater Best Management Practices. EPA-821-R-99-012 Part D.
- For additional information pertaining to Bioretention Systems, see the works cited in the San Diego County LID Literature Index.

Fact Sheet 4. Vegetated Swale / Rock Swale



Conditions, dimensions, and materials shown are typical. Modifications may be required for proper applications, consult qualified professional.

Vegetated / rock swales are vegetated or rock lined earthen channels that collect, convey, and filter site water runoff and remove pollutants. Swales are an alternative to lined channels and pipes; configuration and setting are unique to each site.

CHARACTERISTICS

- If properly designed and maintained, swales can last for at least 50 years.
- Can be used in all soil types, natural or amended.
- When swales are not holding water, they appear as a typical landscaped area.
- Water is filtered by vegetation/rocks and pollutants are removed by infiltration into the subsurface of the soil.
- Swales also serve to delay runoff peaks by reducing flow velocities.

APPLICATION

- Swales are most effective in removing coarse to medium sized sediments.
- Parking lot medians, perimeters of impervious pavements.
- Street and highway medians, edges (in lieu of curb and gutter, where appropriate).
- In combination with constructed treatment systems or sand filters.

DESIGN

- Vegetation of each swale is unique to the setting, function, climate, geology, and character of each site and climatic condition.
- Can be designed with natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff.
- Grass swales move water more quickly than vegetated swales. A grass swale is planted with salt grass; a vegetated swale is planted with bunch grass, shrubs or trees.
- Rocks, gravel, boulders, and/or cobbles help slow peak velocity, allow sedimentation, and add aesthetic value.

- Pollutant removal effectiveness can be maximized by increasing residence time of water in swale using weirs or check dams.
- Swales are often used as an alternative to curbs and gutters along roadways, but can also be used to convey stormwater flows in recreation areas and parking lots.
- Calculations should also be provided proving the swale capable of safely conveying the 100-year flow to the swale without flooding adjacent property or infrastructure.
- See County of San Diego Drainage Design Manual for design criteria. (section 5.5) <http://www.sdcountry.ca.gov/dpw/docs/hydrologymanual.pdf>

MAINTENANCE

- Swale maintenance includes mowing and removing clippings and litter. Vegetated swales may require additional maintenance of plants.
- Periodically remove sediment accumulation at top of bank, in swale bed, or behind check dams.
- Monitor for erosion and reseed grass or replace plants, erosion control netting and mulch as necessary. Fertilize and replace vegetation well in advance of rainy season to minimize water quality degradation.
- Regular inspections and maintenance is required during the establishment period.

LIMITATIONS

- Only suitable for grades between 1% and 6%; when greater than 2.5% should be paired with weir or check dam.
- "Turf" swales will commonly require irrigation and may not meet State water conservation goals.
- Irrigated vegetation is not appropriate in certain sites. Xeriscape techniques, natural stone and rock linings should be used as an alternative to turf.
- Wider road corridors may be required to incorporate swales.
- Contributing drainage areas should be sized to meet the stormwater management objective given the amount of flow that will be produced.
- When contributing flow could cause formation of low-flow channel, channel dividers must be constructed to direct flow and prevent erosion.

ECONOMICS

- Estimated grass swale construction cost per linear foot \$4.50-\$8.50 (from seed) to \$15-20 (from sod), compare to \$2 per inch of diameter underground pipe e.g., a 12" pipe would cost \$24 per linear foot).
- \$0.75 annual maintenance cost per linear foot

REFERENCES

- CALTRANS – Storm Water Handbook (cabmphandbooks.com)
- For additional information pertaining to Swales, see the works cited in the San Diego County LID Literature Index.

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Analysis prepared by:

BHA INC.
5115 AVENDIA ENCINAS, SUITE L
CARLSBAD, CA 92008
(760) 931-8700

TIME/DATE OF STUDY: 13:17 07/09/2008
=====

Problem Descriptions:

LOT 11 - GRASSY SWALE

STORWATER FLOW = 0.13CFS/2=0.07CFS

>>>>CHANNEL INPUT INFORMATION<<<<

CHANNEL Z1(HORIZONTAL/VERTICAL) = 20.00
Z2(HORIZONTAL/VERTICAL) = 20.00
BASEWIDTH(FEET) = 0.00
CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.010000
UNIFORM FLOW(CFS) = 0.07
MANNINGS FRICTION FACTOR = 0.2400
=====

NORMAL-DEPTH FLOW INFORMATION:

>>>>> NORMAL DEPTH(FEET) = 0.17
FLOW TOP-WIDTH(FEET) = 6.79
FLOW AREA(SQUARE FEET) = 0.58
HYDRAULIC DEPTH(FEET) = 0.08
FLOW AVERAGE VELOCITY(FEET/SEC.) = 0.12
UNIFORM FROUDE NUMBER = 0.073
PRESSURE + MOMENTUM(POUNDS) = 2.05
AVERAGED VELOCITY HEAD(FEET) = 0.000
SPECIFIC ENERGY(FEET) = 0.170
=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL FLOW TOP-WIDTH(FEET) = 2.43
CRITICAL FLOW AREA(SQUARE FEET) = 0.07
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.03
CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) = 0.95
CRITICAL DEPTH(FEET) = 0.06
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 0.22
AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) = 0.014
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 0.075
=====

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Analysis prepared by:

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(760) 931-8700

TIME/DATE OF STUDY: 13:24 07/09/2008
=====

Problem Descriptions:

LOT 11 - GRASSY SWALE

100 YEAR FLOW =CIA = $0.41 \times 9.1 \times 0.67 = 2.5\text{CFS}/2 = 1.25\text{CFS}$

ASSUME TC=5MIN

>>>>CHANNEL INPUT INFORMATION<<<<

CHANNEL Z1(HORIZONTAL/VERTICAL) = 20.00
Z2(HORIZONTAL/VERTICAL) = 20.00
BASEWIDTH(FEET) = 0.00
CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.010000
UNIFORM FLOW(CFS) = 1.25
MANNINGS FRICTION FACTOR = 0.0240
=====

NORMAL-DEPTH FLOW INFORMATION:

>>>>> NORMAL DEPTH(FEET) = 0.21
FLOW TOP-WIDTH(FEET) = 8.47
FLOW AREA(SQUARE FEET) = 0.90
HYDRAULIC DEPTH(FEET) = 0.11
FLOW AVERAGE VELOCITY(FEET/SEC.) = 1.39
UNIFORM FROUDE NUMBER = 0.755
PRESSURE + MOMENTUM(POUNDS) = 7.33
AVERAGED VELOCITY HEAD(FEET) = 0.030
SPECIFIC ENERGY(FEET) = 0.242
=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL FLOW TOP-WIDTH(FEET) = 7.58
CRITICAL FLOW AREA(SQUARE FEET) = 0.72
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.09
CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) = 1.74
CRITICAL DEPTH(FEET) = 0.19
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 7.05
AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) = 0.047
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 0.237
=====

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Analysis prepared by:

BHA, INC.
5115 Avenida Encinas, Suite L
Carlsbad, California 92008-4387

TIME/DATE OF STUDY: 10:53 05/20/2009

=====
=====

Problem Descriptions:

100-year flow calculation for vegetated swales around lots
Q=CIA=(0.46)(9.22)(0.7)=2.97CFS - Q\2=1.48 CFS
Tc=5 Min

>>>>CHANNEL INPUT INFORMATION<<<<

CHANNEL Z1(HORIZONTAL/VERTICAL) = 50.00
Z2(HORIZONTAL/VERTICAL) = 50.00
BASEWIDTH(FEET) = 0.00
CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.010000
UNIFORM FLOW(CFS) = 1.48
MANNINGS FRICTION FACTOR = 0.0250

=====
=====

NORMAL-DEPTH FLOW INFORMATION:

>>>>> NORMAL DEPTH(FEET) = 0.16
FLOW TOP-WIDTH(FEET) = 16.21
FLOW AREA(SQUARE FEET) = 1.31
HYDRAULIC DEPTH(FEET) = 0.08
FLOW AVERAGE VELOCITY(FEET/SEC.) = 1.13
UNIFORM FROUDE NUMBER = 0.697
PRESSURE + MOMENTUM(POUNDS) = 7.66
AVERAGED VELOCITY HEAD(FEET) = 0.020
SPECIFIC ENERGY(FEET) = 0.182

=====
=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL FLOW TOP-WIDTH(FEET) = 13.95
CRITICAL FLOW AREA(SQUARE FEET) = 0.97
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.07
CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) = 1.52
CRITICAL DEPTH(FEET) = 0.14
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 7.19
AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) = 0.036
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 0.175
=====

=====
=====

ATTACHMENT F

OPERATION AND MAINTENANCE PROGRAM FOR TREATMENT BMPS

*(NOTE: INFORMATION REGARDING OPERATION AND MAINTENANCE CAN BE OBTAINED
FROM THE FOLLOWING WEB SITE:*

[HTTP://WWW.CO.SAN-DIEGO.CA.US/DPW/WATERSHEDS/LAND_DEV/SUSMP.HTML.](http://www.co.san-diego.ca.us/dpw/watersheds/land_dev/susmp.html))

OPERATION AND MAINTENANCE PROGRAM

Maintenance Schedule and Cost for BMPs

The operation and maintenance requirement (Appendix H Estimated O & M Costs for BMP Project from County of San Diego Stormwater Manual) for each type of BMP is as follows:

Biofilter - Grassy Swale						
Routine Action	Maintenance Indicator	Field Measurement	Measurement Frequency	Maintenance Activity	Site-Specific Requirement	Cost
Height of vegetation	Average vegetation height greater than 12 inches, emergence of trees or woody vegetation.	Visual observation and random measurements through out the side slope area.	Once during wet season, once during dry season	Cut vegetation to an average height of 6 inches and remove trimmings. Remove any trees, or woody vegetation.		\$539.98
Assess adequate vegetative cover	Less than 90 percent coverage in strip/invert/swale or less than 70 percent on swale side slope	Visual inspection of strip/swale. Prepare a site schematic to record location and distribution of barren or browning spots to be restored. File the schematic for assessment of persistent problems.	Assess quantity needed in May each year late wet season and late dry season.	Reseed/revegetate barren spots by Nov.		\$547.19
				Scarify area to be restored to a depth of 2-inches. Restore side slope coverage with hydroseed mixture.		
				If after 2 applications (2 seasons) of reseeding/revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas		

Biofilter - Grassy Swale						
Routine Action	Maintenance Indicator	Field Measurement	Measurement Frequency	Maintenance Activity	Site-Specific Requirement	Cost
Inspect for debris accumulation	Debris or litter present	Visual observation	During routine trashing, per district schedule	Remove litter, and debris.	None	\$0
Inspection for accumulation sediment	Sediment at or near vegetation height, channeling of flow, inhibited flow due to change in slope.	Visual observation	Annually	Remove sediment. If flow in channeled, determine cause and take corrective action. If sediment becomes deep enough to change the flow gradient, remove sediment during dry season, characterize and properly dispose of sediment, and revegetate.	None	\$1046.23
				Notify engineer to determine if regrading is necessary. If necessary, regrade to design specification and revegetate swale/strip. If regrading is necessary, the process should start in May. Revegetate strip/swale in Nov. Target completion prior to wet season.		\$87.26
Inspect for burrows	Burrows, holes, mounds	Visual observation	Annually and after vegetation trimming	Where burrows cause seepage, erosion and leakage, backfill firmly.		\$0

Biofilter - Grassy Swale						
Routine Action	Maintenance Indicator	Field Measurement	Measurement Frequency	Maintenance Activity	Site-Specific Requirement	Cost
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, emergence of trees, woody vegetation, fence damage, ect.	Visual observation	Semi-Annually, late wet season and late dry season.	Corrective action prior to wet season. Consult engineer if an immediate solution is not evident.	Remove any trees, or woody vegetation.	\$751.76

Total
Biofilter
Grassy Swale

\$2,972.42

Detention Bioretention Basin						
Routine Action	Maintenance Indicator	Field Measurement	Measurement Frequency	Maintenance Activity	Site-Specific Requirement	Cost
Basin side slope planted for erosion protection and planted invert.	Average vegetation height greater than 12 inches, emergence of trees or woody vegetation.	Visual observation and random measurements through out the side slope area.	Once during wet season, once during dry season	Cut vegetation to an average height of 6 inches and remove trimmings. Remove any trees, or woody vegetation.		\$2197.92
Slope Stability	Evidence of erosion	Visual Observation	October each year	Reseed/revegetate barren spots prior to wet season		\$150.00
				Contact environmental or landscape architect for appropriate seed mix.		
				Scarify surface if needed		
				If after two applications (2 seasons) of reseeding/ revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over erosion areas. No erosion blanket will be installed in the basin invert.	Not an annual cost	
Inspection for standing water	Standing water for more than 72 hours	Visual observation	Annually, 72 hours after a target 2 storm (0.75 in) event	Drain Facility	None	
			Check and unclog orifice.	Should be annual maintenance		
			Notify engineer, if immediate solution is not evident.			

Detention Bioretention Basin						
Routine Action	Maintenance Indicator	Field Measurement	Measurement Frequency	Maintenance Activity	Site-Specific Requirement	Cost
Inspection for trash and debris	Debris/trash present	Visual observation	During routine trashing, per Districts schedule	Remove and dispose of trash and debris	None	
Inspection for sediment management and characterization if sediment for removal	Sediment depth exceeds marker on staff gage	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually	Remove and properly dispose of sediment. Regrade if necessary.		\$1228.68 (once every 5 years)
Inspection for burrows	Burrows, holes, and mounds.	Visual observation	Annually and after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.		
General Maintenance Inspection	Inlet structure, outlet structures, side slopes or other features damaged, significant erosion, emergence of tree or woody vegetation, graffiti or vandalism, fence damage, ect.	Visual observation	Semi-Annually, late wet season and late dry season monthly.	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	None	\$751.76
Total Detention Bioretention Basin						\$4328.36

ATTACHMENT G

FISCAL RESOURCES

FISCAL RESOURCES

The TM 5295RPL Sugarbush Project falls within the “Second Category” of the County of San Diego (County) Maintenance Mechanism because the use of detention bioretention basins and bio-filtration grassy swales as Best Management practices (BMP)s.

Second Category:

The County needs to assure ongoing maintenance of the detention bioretention basins. The biofilters (grassy swales) should only be a minimum concern to the County. Property owners will be given the primary responsibility for maintenance, on a perpetual basis (unless a stormwater utility is eventually formed). However, the County (in a “backup” role) needs to be able to step in and perform the maintenance if the property owner fails, and needs to have security to provide funding for such backup maintenance.

Mechanisms to Assure Maintenance:

Stormwater Ordinance Requirement: The County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance (WPO) requires this ongoing maintenance. In the event that the mechanisms below prove ineffective, or in addition to enforcing those mechanisms, civil action, criminal action or administrative citation could also be pursued for violations of the ordinance.

Public Nuisance Abatement: Under the WPO failure to maintain a BMP would constitute a public nuisance, which may be abated under the Uniform Public Nuisance Procedure. This provides an enforcement mechanism additional to the above, and would allow costs of maintenance to be billed to the owner, a lien placed on the property, and the tax collections process to be used.

Notice to Purchasers: Section 67.819(e) of the WPO requires developers to provide clear written notification to persons acquiring land upon which a BMP is located, or others assuming a BMP is located, or others assuming a BMP maintenance obligation, of the maintenance duty.

Condition in Ongoing Land Use Permits: For those applications (listed in WPO Section 67.804) upon whose approval ongoing conditions may be imposed, a condition will be added which requires the owner of the land upon which the stormwater facility is located to maintain that facility in accordance with the requirements specified in the Standard Urban Stormwater Management Plan. Failure to perform maintenance may then be addressed as a violation of the permit, under the ordinance governing that permit process.

Subdivision Public Report: Tentative Map and Tentative Parcel Map approvals will be conditioned to require that, prior to approval of a Final or Parcel Map, the subdivider shall provide evidence to the Director of Public Works, that the subdivider has requested the California Department of Real Estates to include in the public report to be issued for the sales of lots within the subdivision, a notification regarding the maintenance requirement. (The requirement for this condition would not be applicable to subdivisions which are exempt from regulation under the Subdivided Lands Act, or for which no public report will be issued).

BMP Maintenance Agreement with Easement and Covenant: An agreement will be entered into with the County, which will function three ways:

- (a) It will commit the land to being used only for purposes of the BMP;
- (b) It will include an agreement by the landowner, to maintain the facilities in according with the CMP (this obligation would be passed on to future purchasers or successors of the landowner, as a covenant); and
- (c) It will include an easement giving the County the right to enter onto the land (and any necessary adjacent land needed for access) to maintain the BMPs.


This would be required of all application listed in WPO Section 67.804. In the case of subdivisions, this easement and covenant would be recorded on or prior to the Final or Parcel Map.

Funding:

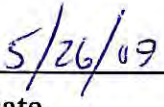
The Developer would provide the County with security to substantiate the maintenance agreement, which would remain in place for 5 years. The amount of the security would equal the estimated cost of 2 years of maintenance activities. The security can be a cash deposit, letter of credit, or other form acceptable to the County. If a stormwater utility or other permanent mechanism is put into place, it could assume either a primary or backup maintenance role.

ATTACHMENT H
CERTIFICATION SHEET

This Storm Water Mitigation Plan has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.



Ronald L. Holloway
Registered Civil Engineer



Date



ATTACHMENT J

2006 CWA SECTION 303(d) LIST OF WATER QUALITY LIMITED SEGMENT

2006 CWA SECTION 303(d) LIST OF WATER QUALITY LIMITED SEGMENTS REQUIRING TMDLS

SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD

USEPA APPROVAL DATE: JUNE 28, 2007

REGION TYPE	NAME	CALWATER WATERSHED	POLLUTANT/STRESSOR	POTENTIAL SOURCES	ESTIMATED SIZE AFFECTED	PROPOSED TMDL COMPLETION
9 R	Agua Hedionda Creek	90431000	Manganese		7 Miles	2019
			Selenium	Source Unknown	7 Miles	2019
			Sulfates	Source Unknown	7 Miles	2019
			Total Dissolved Solids	Source Unknown	7 Miles	2019
				Urban Runoff/Storm Sewers		
				Unknown Nonpoint Source		
				Unknown point source		
9 E	Agua Hedionda Lagoon	90431000	Indicator bacteria		6.8 Acres	2006
				Nonpoint/Toint Source		
			Sedimentation/Siltation		6.8 Acres	2019
				Nonpoint/Point Source		
9 R	Aliso Creek	90113000	Indicator bacteria		19 Miles	2005
			<i>This listing for indicator bacteria applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy Fork, and English Canyon.</i>			
				Urban Runoff/Storm Sewers		
				Unknown point source		
				Nonpoint/Point Source		
			Phosphorus		19 Miles	2019
			<i>This listing for phosphorus applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy Fork, and English Canyon.</i>			
				Urban Runoff/Storm Sewers		
				Unknown Nonpoint Source		
				Unknown point source		

2006 CWA SECTION 303(d) LIST OF WATER QUALITY LIMITED SEGMENTS REQUIRING TMDLS

SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD

USEPA APPROVAL DATE: JUNE 28, 2007

REGION TYPE	NAME	CALWATER WATERSHED	POLLUTANT/STRESSOR	POTENTIAL SOURCES	ESTIMATED SIZE AFFECTED	PROPOSED TMDL COMPLETION
Toxicity						
<i>This listing for toxicity applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy Fork, and English Canyon.</i>						
Urban Runoff/Storm Sewers					19 Miles	2019
Unknown Nonpoint Source						
Unknown point source						
9	E	Aliso Creek (mouth)	Indicator bacteria	Nonpoint/Point Source	0.29 Acres	2005
9	L	Barrett Lake	Color		125 Acres	2019
Manganese					125 Acres	2019
pH					125 Acres	2019
Source Unknown						
Source Unknown						
Source Unknown						
Source Unknown					4.8 Miles	2019
Source Unknown					4.8 Miles	2019
Source Unknown					4.8 Miles	2019
Source Unknown						
Source Unknown					11 Miles	2019
Source Unknown						
Nonpoint/Point Source					202 Acres	2008

ATTACHMENT I

ADDENDUM